Forest Health Protection

Pacific Southwest Region

Northeastern California Shared Service Area

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To: Forest Supervisor and District Rangers, Tahoe National Forest

Subject: Forest insect and disease considerations for vegetation management planning in Tahoe National Forest campgrounds (FHP Report NE19-01).

Background

At the request of Crystal Perez Gonzalez, Enterprise Program Silviculturist, Danny Cluck, Forest Health Protection (FHP) Entomologist, and Bill Woodruff, Plant Pathologist, conducted a field evaluation of three campgrounds (Wild Plum, Sardine and Yuba Pass) that represented a variety of forest health issues common to many Tahoe NF campgrounds. The objective of this visit was to evaluate existing stand conditions that could impact vegetation management planning and discuss treatment alternatives. Recommendations provided in this report will assist in the formulation of vegetation management plans, including silvicultural prescriptions, aimed at reducing overall stand density and reducing hazard trees. Erin Hooten, Enterprise Program Silviculturist, also participated in the site visit.

Key Findings

- High stand density, an increase in the percentage of shade tolerant species such as white fir and incense cedar and the presence of root disease in white fir have created unhealthy stand conditions within Wild Plum Campground. Most white fir are infected with Heterobasidion root disease that is contributing to tree mortality and hazard.
- Western dwarf mistletoe infections in Jeffrey pine at Sardine are contributing to tree mortality and hazard. Poor growing site is inhibiting tree regeneration. Many lodgepole pine are infected with western gall rust, causing some trees to be considered hazards.
- Root diseased red fir stands at Yuba Pass Campground contain numerous hazard trees that should be removed. Campsites may need to be relocated or closed if hazards cannot be abated.
- A review of past FHP evaluations and site visits to various Tahoe NF campgrounds and

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administrative sites highlight ongoing issues of overstocked stands as related to bark beetle-caused tree mortality and the negative impacts of Heterobasidion root disease infected true fir contributing to tree mortality and hazard.

Campground Site Descriptions

Wild Plum Campground (Yuba River RD) is located approximately 2 miles east of Sierra City, CA at an elevation of 4,500 feet (39.566874° N and 120.602751° W). Annual precipitation ranges between 60 and 70 inches. Forest cover is Sierra Nevada mixed conifer that includes ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*), incense cedar (*Calocedrus decurrens*), Douglas-fir (*Psuedotsuga menziesii*) and black oak (*Quercus kelloggii*). These species are all present in the overstory but the understory is dominated by white fir and incense cedar. Nearly all stands are overstocked.

Sardine Campground (Yuba River RD) is located approximately 1.5 miles northwest of Bassetts, CA at an elevation of 5,750 feet (39.619809° N and 120.616738° W). Annual precipitation ranges between 60 and 70 inches. Forest cover is primarily Jeffrey pine (*Pinus jeffreyi*) within the drier upland area, with lodgepole pine (*Pinus contorta*) occupying wetter riparian locations. White fir and incense cedar is also present within the campground. Stands are fairly open with very little regeneration on mostly rocky soils.

Yuba Pass Campground (Sierraville RD) is located approximately 3.5 miles west of Sattley, CA at an elevation of 6,750 feet (39.615132° N and 120.491820° W). Annual precipitation ranges between 60 and 70 inches. Forest cover is primarily red fir (*Abies magnifica*) with scattered white fir in the understory. Lodgepole pine and aspen (*Populus tremuloides*) stands are also present next to the open meadow area. Stands are dense with scattered large old growth red fir.

Figure 1. Dying white fir, attacked by fir engraver beetle, within root disease pocket. Wild Plum Campground, 2019.

Forest insect and disease conditions

Wild Plum

Bark beetle activity observed during the site visit was primarily in white fir where fir engraver beetle (*Scolytus ventralis*) has recently caused high levels of tree mortality throughout the campground (Figure 1). White fir mortality was also associated with Heterobasidion root disease (caused by *Heterobasidion occidentale,* formerly referred to as S-type annosus root disease) (Figure 2). This has resulted in a couple of large openings among campsites (Figure 3).

Figure 2. Delamination along annual tree rings associated with Heterobasidion root disease found in white fir, Wild Plum Campground, 2019.

Figure 3. High levels of white fir mortality are leading to a reduction in canopy cover within a few campsites at Wild Plum Campground, 2019.

Aerial detection surveys (ADS) also mapped a high level of western pine beetle (*Dendroctonus brevicomis*)-caused mortality of ponderosa pine in the surrounding area in 2016 during the peak of the recent drought (Figure 4).

Sardine

Western dwarf mistletoe (*Arceuthobium campylopodum*) was found at various levels in Jeffrey pine causing branch brooms and poor needle retention. Some heavily infected trees were recently attacked and killed by California flatheaded borer (*Phaenops californica*) (Figure 5).

Figure 4. Ponderosa pine mortality next to Sierra City, CA and Wild Plum Campground (2016 R5 ADS).

Lodgepole pine dwarf mistletoe (*Arceuthobium americanum*) and western gall rust (*Peridermium harknessii*) were both found infecting lodgepole pine. Older western gall rust infections have caused large hip cankers on some trees, creating a weak point in the bole that could lead to tree failure.

The few white fir growing on the site were showing signs of fir engraver beetle (*Scolytus ventralis*) attack resulting in top-kill and whole tree mortality (Figure 6). Heterobasidion root disease (caused by *Heterobasidion occidentale,* formerly referred to as S-type annosus root disease) was also suspected as an underlying factor but not confirmed at this site.

Yuba Pass Campground

Evidence of Heterobasidion root disease, conks in old cut stumps (Figure 7), was found in several locations throughout the campground and is suspected to be a contributing factor in the observed

crown decline in many of the old growth trees (Figure 8). Other crown decline factors were red fir dwarf mistletoe (*Arceuthobium abietinum* f.sp. *magnificae*) and Cytospora canker (*Cytospora abietis*). Both were observed in several trees causing branch deformity and dieback.

Figure 5. Dwarf mistletoe infected Jeffrey pine attacked and killed by California flatheaded borer. Sardine Campground, 2019.

<u>Conditions in other campgrounds based on past FHP site visits.</u>

Robinson Flat Campground on the American River RD has similar conditions to Yuba Pass; large, old red fir infected with dwarf mistletoe, Cytospora canker and, most importantly, Heterobasidion root disease. These conditions set up the campground for long-term problems in dealing with hazard trees.

Giant Gap and Shirttail Creek Campgrounds (Sugar Pine Reservoir), American River RD, contain ponderosa pine and ponderosa pine dominated mixed conifer forests that are severely overstocked in many areas. These areas were subject to high levels of western pine beetle activity from 2013 through 2017 (Figure 9).

Mountain pine beetle activity has been an issue in lodgepole pine dominated campgrounds on the Truckee RD such as Goose Meadow and Silver Creek. Treatments such as green infested tree removal and application of pheromones (verbenone) have been implemented periodically in an attempt to reduce tree mortality.

Figure 6. White fir attacked and killed by fir engraver beetle. Sardine Campground, 2019.

Figure 7. Old fruiting body, or conk, of *H. occidentale*, the fungus that causes Heterobasidion root disease. Conk was located in old red fir stump. Yuba Pass Campground, 2019.

Figure 8. Red fir stand with older trees showing signs of crown dieback due to root disease, Cytospora canker and dwarf mistletoe. Younger trees are generally healthy. Yuba Pass Campground, 2019.

Figure 9. Ponderosa pine mortality at Sugar Pine Reservoir, American River RD (2016 R5 ADS).

Stand conditions and mortality

Many of the Tahoe NF campgrounds are overstocked and have exhibited elevated levels of tree mortality caused by bark beetles, especially during periods of drought. Root disease is also a major issue at many sites causing mortality and hazard in the true fir component, even when stocking levels are not excessive. This is especially evident in mixed conifer stands where white fir is dying at a much higher rate than other species. Mapped tree mortality acquired from the Forest Health Monitoring Aerial Detection Surveys from 2014-2018 were summarized in relation to Tahoe NF campground locations (Appendix A). A cursory review of the results highlights the higher level of mortality in lower elevation pine dominated stands and lower to mid elevation mixed conifer stands with high levels of white fir such as those found in many parts of the American and Yuba River RDs.

Forest Health Protection recently developed a treatment priority map for Region 5 to help land managers prioritize thinning treatments at the landscape level. Public version can be viewed here: https://usfs.maps.arcgis.com/apps/webappviewer/index.html?id=3a2dab80192741808d635461b05a2216. This map depicts forested areas in California that are the most susceptible to drought and bark beetle-caused tree mortality based on forest type and stand density. These areas also meet the criteria of existing on slopes <=35% and being outside of wilderness areas, wild and scenic river corridors and designated roadless areas. Additional criteria include not having burned at moderate to high severity since 1998 and not having been thinned since 2005. In addition to being overly dense, these areas have a history of tree mortality during drought resulting in heavy fuel loads and higher risk of stand replacing wildfire. Highest priority areas consist of high density pine stands, pine-dominated mixed conifer stands and fir-dominated mixed conifer and white fir stands growing on historically pine dominated sites. Second priority areas consist of high density fir-dominated mixed conifer and white fir stand on wetter sites. All mapped stands are California Wildlife Habitat Relationship size class 4, 5 and 6. All Tahoe NF campground locations were compared to forest health treatment priority areas with result listed in Appendix A.

It is clear that most Tahoe NF campgrounds are located within or adjacent to unhealthy forests that are experiencing elevated levels of mortality. Appendix A is intended to highlight these conditions and help prioritize areas for treatment.

Considerations for thinning treatments

When planning thinning treatments, it should be recognized that the target stand density and species composition is an average to be applied across the landscape and some variability may be desired to increase heterogeneity. Tree removal should include trees heavily infected with dwarf mistletoe, root disease and trees infested with bark beetles. Small group harvest could also be utilized to remove true fir that are within known Heterobasidion root disease centers or are heavily infested with dwarf mistletoe. This would create openings that could be planted with non-host species suitable for the site.

In most cases, thinning to a relative density of 25 - 40% (relative to the maximum Stand Density Index, or SDI) for a specific conifer species or for a weighted composition of conifer species will effectively reduce competition for limited water and nutrients and reduce the susceptibility to future bark beetle-caused tree mortality. This approach will also increase the longevity of

treatments as they should stay below 60% relative density, the general threshold for self-thinning, for many years. However, this level of density reduction may be too low for a campground situation where higher canopy cover provides shade and additional understory trees provide screening. Land managers may choose to keep stands closer to the 55% relative stand density level to achieve these other objectives but in doing so, they will need to plan for more frequent thinning treatments in the future.

The presence of Heterobasidion root disease in true fir, especially white fir, should be considered when developing silvicultural prescriptions. Root diseased true fir are at a higher risk for fir engraver attacks than uninfected trees during droughts. Leaving high numbers of root diseased trees will likely lead to higher levels of mortality over the long-term, reducing large tree canopy cover and increasing fuels. It also increases the number of hazard trees that will need to be abated each year. Heterobasidion root diseased true fir can fail at any time, even trees that appear healthy. Leaving these trees will also reduce opportunities for successful regeneration of shade intolerant species that are not susceptible hosts to *H. occidentale*.

The best option for managing *H. occidentale* in white fir is to reduce host abundance in the stand and remove severely infected trees. Various sized openings can be created in the stand to facilitate planting of non-hosts such as incense cedar, ponderosa, sugar and Jeffrey pine. Douglas-fir may also be an option in some locations due to it low susceptibility to infection. Placing these openings on known or suspected root disease pockets will enhance the effectiveness of this strategy for reducing overall infection levels. In addition, greatly reducing white fir stocking in stands that have a non-host overstory component will allow for natural non-host regeneration and create a more resilient species composition over time.

Red fir stands with Heterobasidion root disease should be managed to provide openings for healthy red fir regeneration, reduce disease levels and provide opportunities for western white pine regeneration (where appropriate), including the planting of rust-resistant seedlings. Young and vigorously growing red fir are more resilient the effects of root disease. Thinning young stands can increase growth and reduce potential hazard.

Thinning in campground areas with pure lodgepole pine should emphasize species, age, size and spatial diversity to reduce hazard across the landscape. Treatments can include a variety of prescriptions such group selection, single tree selection, thinning through all diameter classes or thinning through larger diameter size classes that are preferred hosts to mountain pine beetle. Prescriptions in all lodgepole pine stands should emphasize a reduction in the number of > 9” dbh lodgepole pine to below 100 trees per acre. Below this threshold, the number of larger trees can be varied to achieve heterogeneity between stands and but should be reduced to the lowest levels practical in each stand. If a reduction below this level cannot be achieved, a thin from below prescription that leaves residual large trees well-spaced may be an option. This type of thinning can change the microclimate of the stand, creating a less favorable environment for bark beetle pheromone communication. Opening up the canopy creates convection currents and air turbulence through increases in soil temperature as well as increasing wind speed (Bartos and Amman 1989, Amman and Logan 1998). However, leaving a stand consisting of only larger diameter lodgepole pine could leave the campground with very few trees after an outbreak.

The best strategy to decrease the amount of mortality in ponderosa pine stands is to reduce stand density to below 230. SDI 230 is the defined threshold for the zone of imminent bark beetle caused mortality. Within this zone, endemic populations kill a few trees but net growth is still positive (Oliver 1995). Thinning stands to this level will reduce the risk of additional bark beetle-caused mortality by reducing tree competition for limited water and nutrients. An emphasis should also be placed on creating spatial heterogeneity and enhancing conditions for other tree species such as Douglas-fir, incense cedar and black oak. Thinning prescriptions should aim to reduce basal area to a range of 60 to 120 sq.ft./acre. This should effectively reduce the risk of significant western pine beetle-caused mortality.

The latest peer-reviewed research on Jeffrey pine stocking as it relates to Jeffrey pine beetle-caused mortality (Egan et al 2016) and a FHP report for the same study (Egan et al 2009) suggest stocking levels that are at or below SDI 210 (corresponded to < 125 sq.ft./acre of basal area in study plots) to reduce tree mortality during droughts and high bark beetle population pressure. Stocking levels of SDI 110 (corresponded to <80 sq.ft./acre of basal area in study plots) had no Jeffrey pine beetle-caused mortality during the Jeffrey pine beetle outbreak monitored during the study.

Many campgrounds contain larger diameter sugar, ponderosa and Jeffrey pine. Thinning treatments that improve growing conditions for these more shade intolerant species, such as removing a large percentage of the basal area around these trees, would increase their health and vigor, create opportunities for their successful regeneration and improve overall resiliency to disturbance agents (insects, disease, drought and fire). Removing competing trees from the base of large diameter pines combined with stand level thinning has resulted in a measured increase in annual increment growth in old growth ponderosa and Jeffrey pine on the Lassen National Forest (Hood et al 2017).

It is recommended that a registered borate compound be applied to all freshly cut conifer stumps >3” in diameter within campgrounds to reduce the chance of creating new infection centers of *Heterobasidion irregulare* and *H. occidentale* formerly referred to as P-type and S-type annosus root disease, through harvest activity. Areas outside and adjacent to campgrounds should have stumps >14” in diameter treated.

Insecticides and pheromones for protecting trees from bark beetle attack

Insecticides and pheromones for individual tree and small stand protection should be tools available to land managers for suppressing bark beetle-caused mortality in the short-term. These types of treatments have been successfully implemented in several Region 5 campgrounds and saved many trees that would have otherwise been killed during bark beetle outbreaks. Their use is permitted within recreation areas and administrative sites under a Categorical Exclusion. Consult with FHP personnel to assess need and provide guidance if these treatment options are under consideration.

One tool is the spraying of insecticides on tree boles, generally pine species. All non-infested trees greater than 8” DBH that are considered high value within the campgrounds or other administrative areas would be treated with a registered pesticide (either a carbaryl or permethrin

product) by spraying the entire bole to the point of saturation. If there are areas where trees less than 8" DBH make up the majority of a stand, spraying a portion of those in the 6 - 8" dbh range may be appropriate. Insecticide treatments can provide protection up to two years against bark beetle attacks so multiple applications may be required to protect trees through the duration of bark beetle outbreak.

Another option exists for protecting lodgepole pine, western white pine and sugar pine that are hosts for mountain pine beetle. This would be the use of the anti-aggregation pheromone, verbenone. A verbenone product is registered for use in California that is applied to tree boles, either on an individual tree basis or in a grid pattern throughout the stand. This type of treatment has shown some success in fending off mountain pine beetle attacks in lodgepole pine and sugar pine in California.

Systemic insecticides are also available and registered for use in California for bark beetles but their effectiveness is still being evaluated by Forest Health Protection. Please contact your local FHP staff for the latest guidance.

Additional considerations for campgrounds

Trees within the Tahoe NF campgrounds, like most forested high-use recreation areas, are exposed to additional stress factors that can compromise their health and vigor. Firewood collecting sometimes leads to tree wounding from hatchets and saws. Carving and chopping trunks can cause extensive cambium. Foot and vehicle traffic compacts soil and can damage roots. Posting public information signs at campground entrances may help increase awareness of the human impact on campground trees.

Soil compaction can predispose conifers to bark beetle attacks and subsequent mortality. Compaction can reduce the water holding capacity of the soil and suffocate roots, which limits the available oxygen that is necessary for root growth and survival. Damaged and unhealthy roots cannot provide the upper portions of the tree with the water and nutrients it requires to maintain its natural defenses. Soil compaction and associated root injury are long-term problems that may not reveal themselves until several years after the damage has occurred. In order to minimize future soil compaction and root damage, campers should be directed to specific travel corridors from campsites to restrooms, water sources, and specific recreation areas. It is especially important to divert and limit foot and vehicle travel and keep excavation for roads, trails and utilities away from the root zones of trees.

General recommendations for campground renovation

Maintaining and promoting healthy trees are important objectives for development plans in campgrounds. Care should be taken during future campsite, trail and facility construction to minimize negative impacts on the landscape. The following guidelines should be applied for areas under construction or in areas where future construction will take place. Many of these guidelines also apply to established campgrounds.

- Tree density should be appropriate for the site. This will provide access to light, moisture and nutrients and allow the trees to better cope with their altered environment.
- Trees that will directly interfere with structures or that will be seriously damaged during construction or excavation should be removed.
- Leave a mixture of ages and species to provide a continual forest canopy over the years.
- Fence off individual or groups of trees before construction to negate or minimize root damage by soil compaction or trunk and root damage by equipment. Protective fences should be placed, at a minimum, at drip line. Depending on the species, tree roots can exist within a radius two times the crown radius and encompass an area well beyond drip line. Drip line is defined by the outer edge of the foliage. Penalties for damaging trees should be incorporated into tree removal or construction contracts.
- Road or lot grades should be changed as little as possible. Grading damages roots and can set up conditions that favor soil erosion. It can also alter the contour such that the flow of surface and subsurface water is drastically affected.
- Trenches should always be dug away from tree roots.
- Do not back fill with earth or rocks around the trunks of trees.
- Avoid paving with either concrete or asphalt over root systems, or close to the trunks of trees.
- Use caution in applying wood preservatives and other chemicals to buildings. Trees and other plants have been killed by direct contact with them or as a result of their runoff in rainwater.
- Avoid leaving green pine slash on site to prevent the buildup of pine engraver (*Ips pini*) beetle populations that may attack standing green trees.

Future construction or vegetation management activities that incorporate the above guidelines will help assure the existence of vigorous and healthy trees following project completion.

Considerations for hazard trees

Despite the effectiveness of any long or short-term plans to prevent tree injury and mortality, some trees, through declining health, will eventually become hazards to the public. To minimize risk, hazard trees should be identified and removed before they fail. The current practice for many National Forest campgrounds is to remove trees as they die. This eliminates the risk from dead trees but fails to address living trees that are infected with root disease, heart rot, and/or have a structural defect. These high-risk green trees are equally hazardous and should not be overlooked.

It is recommended that the District develop a hazard tree evaluation and monitoring plan for these recreation areas. Region 5 Forest Health Protection has recently developed hazard tree guidelines that can assist with this process (Angwin et al 2012), including a Survey123 App that allows for rapid assessment and record keeping. In the short-term, trees within the campgrounds, and within striking distance of a target, that have obvious stem decay, dead tops and/or large dead branches should be carefully evaluated and hazards removed or pruned as soon as possible. All standing dead trees within striking distance of any target should be removed immediately.

Campgrounds that are located within true fir stands or mixed conifer stands with a high percentage of white fir are some of the most difficult to manage due to the presence of root disease and other

forest pathogens. Green hazard trees are typically abundant and mortality is chronic, especially during droughts. Many trees are often killed by either fir engraver beetles, wood borers or a combination of both. Tree mortality will likely be an ongoing problem in these areas creating the need for annual inspections and hazard tree abatement. Another concern is that if a large number of trees need to be removed due to high failure potential, the stand may be left understocked, relatively open and potentially vulnerable to wind throw. All true fir, and especially white fir, within recreation areas should be carefully evaluated for Heterobasidion root disease. Having the true fir component of the recreation area heavily impacted by Heterobasidion root disease is an extremely dangerous situation. Efforts should be made immediately to abate obvious hazard trees and plan for their replacement over the long-term with tree species that are not susceptible to *H. occidentale* (e.g. pines species, incense cedar, Douglas-fir). In addition, stand density should be reduced, with an emphasis on retaining non-host species, to increase the health and vigor of individual trees. Where true fir are to be retained, younger trees, with healthy crowns, should be favored over older trees. However, leaving residual true fir will allow root disease to persist within the area, leading to more hazard trees over the long-term.

For Heterobasidion root disease, it is reasonable to use the condition of the crown as an indicator of advanced decay. Although not always caused by root decay, a thin crown does indicate poor tree vigor. A tree with reduced photosynthesis is not able to maintain healthy roots as well as a tree with a full and healthy crown. In the presence of root disease, unhealthy roots will likely be overcome with decay faster than vigorously growing roots. For this reason, the thinner the crown of a tree in an area where root disease is present, the more likely it is that the roots have been weakened by decay.

Potential for funding through the Western Bark Beetle Program

Forest Health Protection may be able to assist with funding, including NEPA activities, for thinning and sanitation within Tahoe NF campgrounds and recreation areas. Thinning treatments that reduce stand density and change species compositions sufficient to lower the risk to bark beetle-caused mortality would meet the minimum requirements for Western Bark Beetle Program funding and would be supported by this evaluation. If you are interested in this competitive funding please contact me for assistance in developing and submitting a proposal.

If you have any questions regarding this report and/or need additional information please contact Danny Cluck at 530-252-6431.

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Angwin, P.A., D.R. Cluck, P.J. Zambino, B.W. Oblinger and W.C. Woodruff. 2012. *Hazard Tree Guidelines For Forest Service Facilities and Roads in the Pacific Southwest Region*. US Forest Service, Forest Health Protection, Region 5, Vallejo, CA. Report # RO-12-01. 40 p.

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Appendix A: Forest Health Conditions for Tahoe NF Campgrounds

Ranger District	SITE_ID	Campground Name	Part of or within ¼ mile of Forest Health Priority Treatment Area?*	Part of or within ¼ mile of mapped tree mortality area? (2014 - 2018 survey years)*	Intensity of Mortality (TREES/ACRE)
AR	73077	CASA LOMA	YES	YES	>10
AR	73304	ELLIOT RANCH	YES	YES	>10
AR	73162	FINNING MILL	YES	YES	>10
AR	36102	GIANT GAP	YES	YES	>10
AR	73163	GIANT GAP RIDGE	YES	YES	>10
AR	73324	GREEK STORE	YES	YES	>10
AR	73164	HUMBUG RIDGE	YES	YES	>10
AR	73170	LAST CHANCE	YES	YES	>10
AR	73169	LITTLE OAK FLAT	YES	YES	>10
AR	12158	NORTH FORK	YES	YES	>10
AR	73072	ONION VALLEY	YES	YES	>10
AR	73318	PEAVINE ROAD	YES	YES	>10
AR	12248	SECRET HOUSE	YES	YES	>10
AR	36101	SHIRTTAIL CREEK	YES	YES	>10
AR	73300	SPRUCE CREEK LOOP	YES	YES	>10
AR	12244	TALBOT	YES	YES	>10
SV	73192	LAKE OF THE WOODS	YES	YES	>10
SV	73187	MEADOW LAKE SHORELINE	YES	YES	>10
SV	73188	MILTON RESERVOIR	YES	YES	>10
SV	73186	WHITE ROCK	YES	YES	>10
TR	73000	BOCA SPRINGS	YES	YES	>10
TR	12331	GOOSE MEADOW	YES	YES	>10
TR	12330	SAGEHEN CREEK	YES	YES	>10
YR	73122	BRANDY CITY	YES	YES	>10
YR	73104	BRIDGER CREEK	YES	YES	>10
YR	73092	BURLINGTON	YES	YES	>10
YR	73139	BUTCHER RANCH	YES	YES	>10
YR	73158	CHAPMAN	YES	YES	>10
YR	23189	DARK DAY	YES	YES	>10
YR	12160	GROUSE RIDGE	YES	YES	>10
YR	26055	LOGANVILLE	YES	YES	>10

YR	12201	SALMON CREEK	YES	YES	>10
YR	23187	SCHOOLHOUSE	YES	YES	>10
AR	12245	AHART	YES	YES	≤10
AR	12249	BIG RESERVOIR	YES	YES	≤10
AR	73316	BIG VALLEY BLUFF	YES	YES	≤10
AR	73319	DUNCAN CREEK	YES	YES	≤10
AR	73321	DUNCAN DIVERSON	YES	YES	≤10
AR	12243	FRENCH MEADOWS	YES	YES	≤10
AR	73070	FULDA CREEK	YES	YES	≤10
AR	73307	GIANT GAP ROAD	YES	YES	≤10
AR	73172	JACK ROBINSON	YES	YES	≤10
AR	73315	LAKE VALLEY	YES	YES	≤10
AR	73308	MITCHELL MINE	YES	YES	≤10
AR	22445	POPPY	YES	YES	≤10
AR	12246	ROBINSON FLAT	YES	YES	≤10
AR	73303	SODA SPRINGS	YES	YES	≤10
AR	73167	TADPOLE / SUN FLOWER HILL AREA	YES	YES	≤10
SV	12305	BEAR VALLEY OHV	YES	YES	≤10
SV	12309	COLD CREEK	YES	YES	≤10
SV	12306	COTTONWOOD	YES	YES	≤10
SV	12277	EAST MEADOW	YES	YES	≤10
SV	27805	FINDLEY	YES	YES	≤10
SV	27806	FIR TOP	YES	YES	≤10
SV	12278	JACKSON POINT BOAT IN	YES	YES	≤10
SV	12307	LOWER LITTLE TRUCKEE	YES	YES	≤10
SV	73195	NICHOLS CREEK	YES	YES	≤10
SV	12276	PASS CREEK	YES	YES	≤10
SV	28495	PASS CREEK ANNEX	YES	YES	≤10
SV	73196	SMITHNECK	YES	YES	≤10
SV	12279	WOODCAMP	YES	YES	≤10
SV	12308	YUBA PASS	YES	YES	≤10
TR	73222	ALDER CREEK	YES	YES	≤10
TR	25462	ANNIE MCLOUD	YES	YES	≤10
TR	73217	BEAR LAKE	YES	YES	≤10
TR	26074	BOYINGTON MILL	YES	YES	≤10
TR	73202	CASCADE LAKE / LONG LAKE	YES	YES	≤10
TR	73204	CASTLE PEAK	YES	YES	≤10
TR	12332	GRANITE FLAT	YES	YES	≤10
TR	12335	LAKESIDE	YES	YES	≤10

TR	12337	SILVER CREEK CG	YES	YES	≤10
YR	25435	BERGER CREEK	YES	YES	≤10
YR	73088	BULLPEN LAKE	YES	YES	≤10
YR	36056	CAL IDA	YES	YES	≤10
YR	12205	CHAPMAN CREEK	YES	YES	≤10
YR	73089	CLYDE MOUNTAIN	YES	YES	≤10
YR	73141	DEER LAKE	YES	YES	≤10
YR	36053	DIABLO	YES	YES	≤10
YR	73117	EMPIRE CREEK	YES	YES	≤10
YR	73123	FIRST DIVIDE	YES	YES	≤10
YR	73111	GASTON	YES	YES	≤10
YR	12154	INDIAN SPRINGS	YES	YES	≤10
YR	12274	JACKSON CREEK	YES	YES	≤10
YR	73105	MOONEY CREEK	YES	YES	≤10
YR	73130	MORRISTOWN	YES	YES	≤10
YR	73129	OAK VALLEY	YES	YES	≤10
YR	73134	PACKER SADDLE	YES	YES	≤10
YR	36063	PACKSADDLE	YES	YES	≤10
YR	73048	PIERCE CREEK	YES	YES	≤10
YR	73064	PIERCE MEADOW	YES	YES	≤10
YR	73106	RUCKER LAKE	YES	YES	≤10
YR	73136	SALMON LAKES	YES	YES	≤10
YR	12200	SARDINE	YES	YES	≤10
YR	73079	SAWMILL LAKE	YES	YES	≤10
YR	12202	SIERRA	YES	YES	≤10
YR	12203	SNAG LAKE	YES	YES	≤10
YR	73137	TAMARACK LAKES	YES	YES	≤10
YR	73128	TRAPPER CAMP	YES	YES	≤10
YR	12199	UNION FLAT	YES	YES	≤10
YR	73110	WEAVER LAKE	YES	YES	≤10
YR	12282	WHITE CLOUD	YES	YES	≤10
YR	73113	WILLOW CREEK	YES	YES	≤10
YR	12161	WOODCHUCK	YES	YES	≤10
AR	73179	CANADA HILL	YES	NO	0
AR	22444	LEWIS	YES	NO	0
SV	27804	UPPER LITTLE TRUCKEE	YES	NO	0
TR	25465	BOCA REST	YES	NO	0
TR	73210	HOKE / VERDI	YES	NO	0
TR	26077	LOGGER	YES	NO	0

TR	29565	PROSSER FAMILY	YES	NO	0
YR	12283	CANYON CREEK	YES	NO	0
YR	73099	FALL CREEK	YES	NO	0
YR	73114	GARDEN POINT	YES	NO	0
YR	24548	GARDEN POINT BOATING	YES	NO	0
YR	12196	WILD PLUM	YES	NO	0
AR	73182	LITTLE AMERICAN VALLEY	NO	YES	>10
YR	73143	BEARTRAP	NO	YES	>10
YR	73001	BULLARDS LAKESHORE	NO	YES	>10
YR	73140	GOLD VALLEY	NO	YES	>10
YR	12153	HAMPSHIRE ROCKS	NO	YES	>10
YR	73053	LINDSEY LAKE	NO	YES	>10
YR	73160	LUNCH CREEK	NO	YES	>10
YR	73108	SANFORD LAKE	NO	YES	>10
AR	73181	HEAD WATERS MIDDLE FORK	NO	YES	≤10
AR	73073	MEARS MEADOW	NO	YES	≤10
AR	73184	MILDRED LAKES	NO	YES	≤10
AR	73178	MUMFORD BAR TO BEACROFT	NO	YES	≤10
AR	73183	PICAYUNE	NO	YES	≤10
AR	73322	RED STAR	NO	YES	≤10
TR	73218	SUMMIT LAKE	NO	YES	≤10
YR	73107	BEYERS LAKES	NO	YES	≤10
YR	36055	CARLTON	NO	YES	≤10
YR	22360	CARR LAKE	NO	YES	≤10
YR	73121	CHEROKEE CREEK	NO	YES	≤10
YR	73144	CHURCH MEADOW	NO	YES	≤10
YR	73145	DEADMAN LAKE	NO	YES	≤10
YR	73098	DOOLITTLE TRAIL	NO	YES	≤10
YR	36532	FIDDLE CREEK	NO	YES	≤10
YR	73109	FIVE LAKES BASIN	NO	YES	≤10
YR	26054	MADRONE COVE	NO	YES	≤10
YR	36054	ROCKY REST	NO	YES	≤10
YR	73147	SPENCER CREEK	NO	YES	≤10
YR	73146	SPENCER LAKES	NO	YES	≤10
AR	73323	FORD POINT	NO	NO	0
AR	73171	INTER BAY	NO	NO	0
AR	73180	LITTLE NEEDLE LAKE	NO	NO	0
AR	73166	SECRET CANYON / AMERICAN HILL	NO	NO	0

SV	73069	MEADOW LAKE	NO	NO	0
TR	12311	ALPINE MEADOWS (MARTIS CREEK)	NO	NO	0
TR	12329	BOCA	NO	NO	0
YR	73101	CATFISH COVE	NO	NO	0
YR	73115	FRENCHY POINT	NO	NO	0
YR	36533	FRENCHY POINT	NO	NO	0
YR	12208	INDIAN VALLEY	NO	NO	0
YR	73126	KANAKA CREEK	NO	NO	0
YR	73116	MADRONE COVE	NO	NO	0
YR	12207	RAMSHORN	NO	NO	0
YR	73148	SHENANIGAN FLAT	NO	NO	0
YR	12152	STERLING LAKE	NO	NO	0